

Effectiveness of linguistic base approach and traditional articulation therapy to improve articulation among children (8-12 years) with mild to severe hearing loss

Atia-ur-Rehman, Muhammad Sikander Ghayas Khan, Hafsa Noreen, Muhammad Azzam Khan

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Author Information

Ms. Atia-ur-Rehman

Associate Professor
Allied Health Sciences
Rashid Latif Medical College
Lahore, Punjab, Pakistan.

From: Department of Health
Professional Technologies,
The University of Lahore,
Punjab, Pakistan

Dr. Muhammad Sikander
Ghayas Khan
Associate Professor

Ms. Hafsa Noreen
Assistant Professor

Mr. Muhammad Azzam Khan
Lecturer
(Corresponding Author)
Email:
azzamkhan00@gmail.com

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ABSTRACT

Introduction: Articulation errors are speech disorders, commonly found in children with hearing impairment. Traditional Articulation Therapy and Linguistic base Therapy are most common therapies to intervene the errors.

Objective: To evaluate the effectiveness of Linguistic base therapy and Traditional Articulation Therapy on articulation errors of children with mild to severe hearing loss.

Materials & Methods: This comparative study was conducted at Hamza Foundation Academy for Deaf, Lahore, Pakistan from January 2018 to August 2018 on 10 patients of articulation errors. Sample was divided into two equal groups A & B (Group A, 5 individuals for linguistic base therapeutic approach and Group B, 5 individuals for Traditional Articulation Therapy). All patients were aged 8-12 years, had mild to severe hearing loss and used digital hearing aids. TAAPU (Test for assessment Articulation and Phonological Urdu) was used for pre and posttest for assessment of articulation. After assessment, Linguistic Based Approach and Traditional Articulation Therapy was applied on both groups. Both therapies were applied for 3 months, 3 sessions per week; session time was 30-40 minutes, (30 to 35 sessions per patient) Same test was conducted after therapy for post-assessment.

Results: There was a significant difference ($p < 0.001$) in the scores of Traditional Articulation Therapy (mean 104 ± 3.67) and Linguistics (mean 154 ± 3.63). The magnitude of the differences in the means (mean difference = -50.20, 95% CI: -55.52, -44.87) was large ($\eta^2 = 0.9$).

Keywords: Deafness; Hearing Loss; Articulation Disorders; Speech Disorders; Linguistics; Phonetics.

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INTRODUCTION

Speech is the largest commonly used medium and major skill for conversation; consequently, it does generate an enormous contract of interest amongst those who work with children with speech disorders. The significant and compound human behaviors are Verbal communication.¹

According to study approximately 50% to 80% speech disorders are estimated articulation disorders. Articulation is basic element of conversation meant to convey thoughts, meanings, concepts, and feelings through speech sounds to words, words to phrases, and phrase to sentences.² Total populations have more or less 5-10% communication disorders concerning speech, language and hearing.³ According to National Policy for Persons with Disabilities 2002, there are 2.49% disabled Deaf population.⁴ The deaf population of Punjab (Pakistan province) is 8.17% of total population.⁵

Professionals have different approaches for these speech disorders. These integrated approaches options are basic sound to error pattern to main target word and word use in language.⁶ Articulation refers to the concrete movements of the articulators during speech production, and is classified under the basic term of Phonology. An articulation problem may be defined as difficulty in producing a single or more than one sound without any model and without set rule.⁷ The course of Traditional Articulation Therapy (TAT) is: 1- Sensory-perceptual training (ear training)- Identification, Isolation, Stimulation & Discrimination; 2- Production training & Sound establishment/sound acquisition; 3- Production training- Sound stabilization, Isolation, Nonsense syllables, Words, Phrases, Sentences & Conversation; 4- Transfer and carryover; and 5- Maintenance. The trademark of TAT production is in sequencing of activities.⁸

Linguistic Based Approach (LBA) is based on distinctive features theory, and involves usually one of two procedures. The child's rule system differs from the adult rule system and the child

needs to learn.⁹ LBA is also known as nonlinear phonological approach. It is guided with laws of linguistic and features of sounds. The therapist focuses on the required sounds without stimulability and phonetic difficulty. Recurrently, minimal pair comes up to working with dissimilarity of two latest sounds so as to be different by features and class like obstruent vs. liquid and liquid vs. nasals. It maximize differences the feature, manner, place and voice. In broad-spectrum, the nonlinear management teaches the majority of complicated aspect of production and makes possible general modification in intelligibility.¹⁰

There are learning Challenges of all most all children with Hearing loss. The children with hearing loss educate alongside with speech and language therapy.¹¹ Children with hearing loss are mostly poor linguistically as compare to peers.¹²

To know the child’s requirement of therapy will include aided and unaided audiogram of hearing loss Compare to speech banana. Speech Banana is recommended to purposive use for interventional management (speech and language/auditory) of hearing impaired. After complete assessment add the diagram with onset of hearing loss/unaided, while child approach to sound by hearing devices.¹³

OBJECTIVE

To evaluate the effectiveness of Linguistic base therapy and Traditional Articulation Therapy on articulation errors of children with mild to severe hearing loss

MATERIALS & METHODS

The study design was interventional comparative. Data was taken from Hamza Foundation for Deaf Academy and Hospital clinics in Lahore, Punjab, Pakistan. Study was completed in 6 months from January 2018 to August 2018. Study includes 10 hearing impaired individuals with mild to severe hearing loss. The children divided into two equal groups A & B. Group A, 5 individuals were provided linguistic base therapy while Group B, 5 individuals were provided Traditional Articulation Therapy. 10 Patients of articulation errors selected with mild to moderate hearing loss.

The following formula was used for sample size estimation: taking N=8.17, Formula $N/1 + [N + (0.5) (0.5)] = 8.17/1 + [8.17 + 0.25] = 8.17/1 + 2.0425 = 8.17 + 2.0425 = 10.2125$.

Inclusion criteria was as following, both male and female were included in the study, age range was between 8-12 years, mild to Severe bilateral hearing loss, patients were pre-diagnosed with articulation errors, with native language Urdu. Exclusion criteria are as follows, Congenital and acquired articulations error, Presence of any other co-morbidity with hearing impairment, Emotional or organic disorders with hearing impairment.

10 children with mild to moderate hearing loss diagnosed by audiologist with digital hearing aids and age 8-12 years were taken. Informed consent was taken by parents. Articulation assessment was completed with the help of Parent. 10 individuals were divided into two equal groups A & B. Group A, 5 individuals for linguistic base therapeutic approach, Group

B, 5 individuals for Traditional articulation therapy. TAAPU test¹⁴ for articulation error was applied for assessment purposes. Both therapies were applied for 3 months, 3 sessions per week and session time was 30-40 minutes. Same test was applied as post-assessment test. SPSS version 16 was used for statistical analysis. Mean and standard deviation was calculated for qualitative variable while frequency (%) was used for qualitative variable. Levine’s test was used for the comparison.

RESULTS

Results are displayed as Tables 1 to 5 for the various aspects assessed. Tables 1 and 2 depict the mean pretest and posttest scores of TAT and Linguistics; improvements are noted for both.

Table 1: Mean scores of Pre-test and Post-test of those who received TAT.

Categories	Error Mean Scores of TAT					
	Pre-Test Scores			Post-Test Scores		
	Initial	Middle	Final	Initial	Middle	Final
Substitute	50.80	39.00	32.20	36.60	27.80	26.20
Omission	33.00	26.40	37.20	33.00	26.20	33.20
Distortion	34.80	28.60	25.60	33.40	26.20	25.20
Addition	32.00	26.00	25.00	32.00	26.00	25.00

Table 2: Mean scores of Pre-test and Post-test of those who received Linguistics therapy.

Categories	Error Mean Scores of Linguistics					
	Pre – Test Scores			Post – Test Scores		
	Initial	Middle	Final	Initial	Middle	Final
Substitute	52.20	41.20	33.60	35.60	27.60	26.20
Omission	33.40	26.20	37.40	33.00	26.00	31.60
Distortion	36.80	30.00	25.40	34.20	26.40	25.60
Addition	32.00	26.00	25.00	32.00	26.00	25.00

Paired sample t-test results of TAT (Table 3)

There was a significant increase in the Initial sound scores from Pretest scores (mean 46.40 ± 3.04) to post test scores (mean 61.00 ± 2.91), $t(4) = -9.30$, $p < 0.005$ (two-tailed). The mean increase in scores was 15.60 with a 95% confidence interval ranging from -18.95 to -10.24. The eta squared statistic (0.95) indicated a large effect size.

There was a significant increase in the Middle sound scores from Pretest scores (mean 36.20 ± 1.64) to post test scores (mean 49.60 ± 1.67), $t(4) = -26.28$, $p < 0.005$ (two-tailed). The mean increase in scores was 13.20 with a 95% confidence interval ranging from -14.81 to -11.98. The eta squared statistic (0.9) indicated a large effect size.

There was a significant increase in the Final sound scores from Pretest scores (mean 30.00 ± 2.34) to post test scores (mean 41.20 ± 3.83), $t(4) = -6.89$, $p < 0.005$ (two-tailed). The mean increase in scores was 11.80 with a 95% confidence interval ranging from -15.71 to -6.68. The eta squared statistic (0.92) indicated a large effect size. There was a significant increase in the total sound scores from Pretest scores (mean 30.00 ± 2.34) to post test scores (mean 41.20 ± 3.83), $t(4) = -15.09$, $p < 0.005$ (two-tailed). The mean increase in scores was 39 with a 95% confidence interval ranging from -46.40 to -31.99. The eta squared statistic (0.9) indicated a large effect size.

Table 3: Significance testing of scores obtained in TAT
Paired sample t-test result of mean comparison scores of initials in TAT

	Pretest TAT			Posttest TAT			95% CI for mean difference	t	R	df
	M	SD	N	M	SD	N				
Initials Scores	46.40	3.04	5	61.00	2.91	5	-18.95, -10.24	-9.30*	.309	4

Paired sample t-test result of mean comparison scores of Middle in TAT

	Pretest TAT			Posttest TAT			95% CI for mean difference	t	R	df
	M	SD	N	M	SD	N				
Middles Scores	36.20	1.64	5	49.60	1.67	5	-14.81, -11.98	-26.28*	.764	4

Paired sample t-test result of mean comparison scores of Finals in TAT

	Pretest TAT			Posttest TAT			95% CI for mean difference	t	R	df
	M	SD	N	M	SD	N				
Final Scores	30.00	2.34	5	41.20	3.83	5	-15.71, -6.68	-6.89*	.389	4

Paired sample t-test result of TAT

	Pretest TAT			Posttest TAT			95% CI for mean difference	t	R	df
	M	SD	N	M	SD	N				
Total Scores	112	5.84	5	151	7.04	5	-46.40, -31.99	-15.09*	.609	4

*p < 0.05.

Paired sample t-test results of Linguistics (Table 4)

There was a significant increase in the Initial sound scores from Pretest scores (mean 42.00 ± 1.41) to post test scores (mean 62.20 ± 1.30), t(4) = -30.45, p <0.005 (two-tailed). The mean increase in scores was 19.80 with a 95% confidence interval ranging from -22.04 to 18.35. The eta squared statistic (0.9) indicated a large effect size.

Paired sample t test was conducted to evaluate the impact of Linguistics on the Middle sounds of students with hearing impairment. There was a significant increase in the Middle sound scores from Pretest scores (mean 33.20 ± 1.30) to post test scores (mean 50.30 ± 0.83), t (4) = -24.04, p <0.005 (two-tailed). The mean increase in scores was 18.10 with a 95% confidence interval ranging from -14.81 to -11.98. The eta squared statistic (0.9) indicated a large effect size.

Paired sample t test was conducted to evaluate the impact of Linguistics on the Final sounds of students with hearing impairment. There was a significant increase in the final sound scores from Pretest scores (mean 28.80 ± 2.04) to post test scores (mean 41.80 ± 2.86), t(4) = -12.39, p <0.005 (two-tailed). The mean increase in scores was 13.40 with a 95% confidence interval ranging from -15.91 to -10.08. The eta squared statistic (0.9) indicated a large effect size.

Paired sample t test was conducted to evaluate the impact of linguistics on the sounds (initial + Middle + final) of students with hearing impairment. There was a significant increase in the total sound scores from Pretest scores (mean 104 ± 3.67) to post test scores (mean 154 ± 3.63), t(4) = -47.01, p <0.005 (two-tailed). The mean increase in scores was 50 with a 95% confidence interval ranging from -53.16 to -47.23. The eta squared statistic (0.9) indicated a large effect size.

Table 4: Significance testing of scores obtained in Linguistics
Paired sample t-test result of mean comparison scores of initials in Linguistics

	Pretest Linguistics			Posttest Linguistics			95% CI for mean difference	T	R	df
	M	SD	N	M	SD	N				
Initials Scores	42.00	1.41	5	62.20	1.30	5	-22.04, -18.35	-30.45*	.309	4

Paired sample t-test result of mean comparison scores of Middle in Linguistics

	Pretest Linguistics			Posttest Linguistics			95% CI for mean difference	T	r	df
	M	SD	N	M	SD	N				
Middles Scores	33.20	1.30	5	50.30	0.83	5	-14.81, -11.98	-24.04*	-.046	4

Paired sample t-test result of mean comparison scores of Final in Linguistics

	Pretest Linguistics			Posttest Linguistics			95% CI for mean difference	T	r	df
	M	SD	N	M	SD	N				
final Scores	28.80	2.04	5	41.80	2.86	5	-15.91, -10.08	-12.39*	.389	4

Paired sample t-test result of Linguistics

	Pretest Linguistics			Posttest Linguistics			95% CI for mean difference	t	r	df
	M	SD	N	M	SD	N				
total Scores	104	3.67	5	154	3.63	5	-53.16, -47.23	-47.01*	.787	4

*p < 0.05.

Independent Samples t-test to compare the post scores of both therapies (Table 5)

There was a significant difference in the scores of TAT (mean 104.00 ± 3.67) and Linguistics (mean 154 ± 3.63); $t(7.9) = -21.72, p < 0.001$ (two-tailed). The magnitude of the differences

in the means (mean difference = -50.20, 95% CI: -55.52, -44.87) was large (eta squared = 0.9). The results revealed that there was a significant difference in the intervention effectiveness of both therapies. Mean scores of linguistics therapy were higher than the TAT that reveals that Linguistics therapy is more effective to use than TAT.

Table 5: Significance testing of comparative scores of both therapies used

	TAT therapy		Linguistics therapy			95% CI for mean difference	T	df	
	M	SD	N	M	SD				N
Post test Scores	104	3.67	5	154	3.63	5	-55.52, -44.87	-21.72*	7.9

* $p < 0.05$.

DISCUSSION

Coordination and movement among specific oral motor structures and produce sounds, tongue lips and lower jaw with coordinated time and strength. It is a way of verbal message between hearer and speaker. Speech development is based upon hearing ability.¹⁵ Speech disorder among children very common is Articulation disorders. Articulation Disorders are substitution omission, distortion, and addition. The solution to remove these articulation errors is only speech and language therapy and family cooperation. Occasionally find out few errors and sometime finds so many articulation errors that make unintelligible to speech.¹⁶ with articulation errors child mostly produce incorrectly children have difficulty making that sound correctly. The articulation an error does not essential reason it may be apprehension of past continues age, where children are probable to produce such sounds correctly. Causes of speech and language disorders consist of hearing loss, brain injury intellectual disabilities, neurological disorders addiction, physical handicapped and cleft lip/palate recurrently, some causes are unknown.¹⁷

Traditional articulation therapy is very commonly use therapy for articulation disorders. This therapeutic technique is constantly used in sequence according to performance.¹⁸ Sensory perceptual guidance concentrate with identifying the typical sound as well as differentiates from error sound is first step. Correction and verifying is second step. Strengthening the accurate production is third step. Transfer the sound in communication is last step.¹⁹ Linguistic base therapy can be used for speech and as well as language of children with speech disorders. Linguistic therapy actually deal with the acquisition of distinctive features, applied the methods to correct the speech sounds. Linguistic therapy, basic principles including clinical setting, therapeutic formats (may be modified) or included to actual approach. The term distinctive features is at phonological level ,placement of sounds, manner of sounds and cognate (voiced, voiceless).The therapy focused at a time whole manner, placement or cognate, besides to single sound.²⁰

Recent study conducted in UK with two therapeutic techniques of phonological therapeutic management for articulation disorders. Results specified explained targeting different processing skills of phonological planning. A phonological understanding discrepancy knows how to target efficiently with complete word approach. Cognitive linguistic deficit paramount responds to a phonological contrast approach. It is essential to differentially diagnose clinically consistent toward inconsistent phonological disorders. In this study clinician manage severe speech disorders with two therapeutic comparing phonological contrast and core vocabulary therapy.²¹ The results of current study prove an evidence-based option of phonological treatment for speech disorder of children with moderate–severe. Results evaluate the consequence of two different therapies on speech precision and stability of word production of children with consistent and inconsistent speech disorder. In short study proves that linguistic base therapy has multiple techniques according to speech disorders stimulability.²²

A national survey conducted that speech-language pathologists were asked about therapeutic services of severe sound disorders with age of 3 to 6 years. Through e-mailed 2,084 Speech and language pathologists are worked with across pre-elementary set ups. 24% of these concluded all of the survey, with 18% the entire survey completing. Results indicate few speech and language pathologists take 30 or 60 minutes session per week regardless one to one or group session. Traditional articulation technique than other types of intervention some SLPs reported. But many SLPs reported that they are using aspects of phonological interventions, acknowledge the phonological awareness trainings. Experienced speech pathologists are more recognizable to recent advance in phonological interventions as compare to fresh graduates.²³

CONCLUSION

Linguistic base therapy showed slightly good results as compared to Traditional Articulation Therapy.

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